

## Case study

# Multiple stressors impacting a small island tourism destination-community: A nested vulnerability assessment of Oistins, Barbados

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## ABSTRACT

Small island nations face several challenges, both short- and long-term, in the context of a changing climate and socio-economic environments. Consequently, their communities are vulnerable to multiple sources of stress. This study examines the multiple stressors impacting a tourism community, based on 48 interviews and five focus groups, with local and national stakeholders in Oistins, Barbados. The research identifies mechanisms used by respondents to cope and adapt to change and finds that many are short-term oriented, and so under-estimate the potential of long-term climatic change. Moreover, responses to change are often ineffective. A nested analysis indicates important relationships between factors external to Barbados, those inherent to the island, and then those specific to the community. The paper concludes with the suggestion that sectoral and community-level adaptations are not always consistent and/or appropriate and that local stakeholder adaptation is not fully effective in reducing tourism vulnerability.

## 1. Introduction

The Caribbean is considered a ‘*tourism vulnerability hotspot*’, as the region has the world's most tourism intensive economy and because climate change impacts to its sector and economic livelihood are predicted to be significant (UNWTO, UNEP, & WMO, 2008; WTTC, 2015b). Within the Small Island Developing States (SIDS) that comprise most of the Caribbean, destination<sup>1</sup> communities, including workers and local operators, have been identified as the most vulnerable tourism stakeholders to climate change (Scott & Jones, 2006), particularly when employed in low-paid or seasonal positions (Dunn, 2008). Furthermore, as Caribbean countries depend upon the rest of the world for many aspects of their economies, they are also vulnerable to non-climatic global stressors, such as fluctuating commodity prices (Bishop & Payne, 2012). Therefore, it is essential that SIDS in the Caribbean adapt to the effects of climate change and consider how this interacts with non-climatic stressors (Becken, 2013), as failure to do so could have serious and detrimental impacts on their tourism and economic livelihoods (Simpson et al., 2010).

Community-Based Vulnerability Assessments (CBVAs) have been identified as a key method to examine vulnerability to climate change and other stressors, and develop adaptation strategies (Ford et al., 2010). Nevertheless, CBVAs can face challenges in their application, as studies are often isolated, localized and face limits in their comparisons

across and beyond communities, thereby limiting potential to develop adaptation interventions at non-local levels (Smit & Wandel, 2006). In particular, studies often assess vulnerability at the community level and do not consider the larger determinants (i.e., regional, national, global) that can affect the degree to which local adaptations are viable (Adger, Eakin, & Winkel, 2009). To address this, nested case studies can distinguish the determinants of vulnerability at several scales and detail connections between causes and outcomes of vulnerability across governance and geographic contexts (Adger et al., 2009). While the nested case study approach has been promoted to address the shortcomings of CBVAs, it has yet to be applied in a tourism community.

The following study applies the nested case study approach in the tourism destination community of Oistins, Barbados, in order to:

1. Determine whether the nested approach is appropriate for delineating vulnerability and developing adaptation strategies in tourism dependent communities;
2. Understand the climatic and non-climatic stressors influencing vulnerability at the tourism destination-community scale; and,
3. Consider the climate change vulnerabilities of tourism-dependent workers, which no studies have previously examined in the Caribbean, and is a broader gap in the tourism and climate change literature (Kaján & Saarinen, 2013).

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<sup>1</sup> Can be defined as a “... marketable destination... from a small nation to a region, or to a specific resort or site” (UNWTO, 2004, p. 21).

## 2. Vulnerability and the nested approach

Climate change vulnerability can be depicted as the extent to which a system is prone to harm (exposed), internally sensitive and capable of adapting to change (Smit & Pilifosova, 2003). An integrated approach considers vulnerability as scale and time dependent, that can have multiple stressors and is dynamic (Smit & Pilifosova, 2003). Due to this dynamic nature, it is easier to measure the processes that condition a system's vulnerability, where it is viewed as a pre-existing 'context' of a system that renders it susceptible to harm versus an 'outcome' of a linear set of stresses and seen as a particular point in time (O'Brien, Eriksen, Nygaard, & Schjolden, 2007).

Community (place)-based studies, like Community-Based Vulnerability Assessments, can identify the contextual determinants of vulnerability from a particular community, including the present ability to cope with stressors, to ascertain ways of enhancing adaptive capacity or implementing adaptation initiatives (O'Brien et al., 2007; Smit & Wandel, 2006). CBVAs recognize the community as the primary system of interest, but also examine the broader conditions within which it functions, including multiple stressors (Smit & Wandel, 2006). CBVAs have often been used in Arctic communities (Andrachuk & Smit, 2012; Ford & Pearce, 2012), although at the time of our research, none had been conducted in Caribbean tourism communities. More recently, one study has been completed in Jamaica, although it highlighted the need to understand how local communities are shaped by multi-scalar processes (Hogarth & Wojcik, 2016).

In the tourism context, place-based CBVAs would allow for the consideration of climatic conditions and tourism adaptation needs that are pertinent to community members (Becken, 2013; Kaján & Saarinen, 2013). Having said that this approach has critics, particularly those that argue that the connection to broader stressors and determinants of vulnerability are often not comprehensively characterized and limitations exist in comparisons across and beyond systems (Ford et al., 2010; Smit & Wandel, 2006). For these reasons, additional place-based methodologies are needed to more comprehensively capture the dynamic nature of vulnerability and facilitate adaptation planning (Ford et al., 2010).

Nested approaches to vulnerability assessment refer to "assessment where analysis conducted as one-scale is either 'up-scaled' or 'down-scaled', to examine multi-scale processes and determinants of vulnerability" (Preston, Yuen, & Westaway, 2001, p. 195). Such approaches distinguish vulnerability at several scales and detail connections between its causes and outcomes (Adger et al., 2009; Ford et al., 2010). Therefore, a multi-level community vulnerability assessment highlights the suitable scale for adaptation relative to the scale of problem (Pittman, Armitage, Alexander, Campbell, & Alleyne, 2015). Although the nested approach has provided important contributions to understanding vulnerability (Ford et al., 2010), it has yet to be applied in the Caribbean and there is limited understanding of whether this approach provides more useful information compared to the CBVA in tourism destination communities.

In the Caribbean, there have been limited studies examining vulnerability to climate change at the community level using the nested approach. Tourism studies have examined tourist perceptions of climate-related risks, developed disaster vulnerability frameworks and analyzed coastal vulnerability (Becken, Mahon, Rennie, & Shakeela, 2014; Forster, Schuhmann, Lake, Watkinson, & Gill, 2012; Student, Amelung, & Lamers, 2016), though none have examined vulnerability at the destination community level, while also making connections to broader scales. For example, grey literature in the Caribbean and Barbados has examined tourism climate change vulnerability at the national level (CCCCC, 2009; CDEMA, 2009; GOB, 2001; GOB, 2012; UNECLAC, 2011), although there are no connections to the community level. Knowledge gaps also remain in understanding the capacity of local stakeholders and those with tourism-dependent livelihoods in destination communities to adapt to climate change (Kaján & Saarinen,

2013). For these reasons, additional empirical studies are needed to examine the vulnerability of Caribbean tourism destination communities, with a particular focus on local tourism stakeholders (Becken, 2013; Bishop & Payne, 2012).

A further issue that requires study is the impact of multiple stressors on climate change vulnerability. Understanding the multiple interacting perturbations which can increase a system's vulnerability is key to comprehensively assessing exposure-sensitivity and adaptive capacity (Füssel & Klein, 2006), although knowledge limitations remain in understanding tourism sector vulnerability to multiple stressors at the community level in the Caribbean (Becken, 2013). Although some studies focusing on Barbados have examined climate change and tourism (CDEMA, 2013; GOB, 2001; GOB, 2012) and a few have addressed adaptation (CCCCC, 2009; UNECLAC, 2011), none have examined the impacts of multiple stressors.

The following study fills this gap and examines community level vulnerability in the tourism destination community of Oistins, Barbados, in order to determine the validity of the nested approach. The study also provides empirical evidence of community-level vulnerability in a destination community in the Caribbean, with a focus on understanding the vulnerabilities and adaptive capacities of local tourism-dependent stakeholders, and the multiple stressors these communities face.

## 3. Study site and methods

Barbados has a population of 285,916, with the majority settled along the southern and western coasts (WPR, 2014). Tourism is the island's primary industry and in 2014 was valued at US \$1.69 billion, contributing 36.1% to total global GDP (WTTC, 2015a). On average over 523,000 tourists visit Barbados annually for its climate and coastal environment (World Bank, 2015), with primary source markets from Canada, the United States, the United Kingdom and other European countries (GOB, 2012). The island and its tourism sector face high exposure to climate change due to its low-lying karst topography, pressure placed by a dense population on limited resources and a high reliance on coastal infrastructure (Bishop & Payne, 2012). Nevertheless, Barbados is thought to have a higher adaptive capacity than other Caribbean islands, as it has a high performing economy and has undertaken some initiatives to address climate change and its impacts on tourism (Bishop & Payne, 2012).

Oistins is the third most populous town in Barbados (2010 population: 1037) and is situated on the south-coast, within the Christ Church Parish and the South Christ Church (SCC) Constituency Council (Fig. 1) (GOB, 2010). Oistins' tourist attractions include its beaches (with recreational activities), hotels and restaurants, the Bay Garden Vendors Area (BGVA) and the Oistins Fish-Market (BTPA, 2015). Tourism-related activities are also connected to the consumption of fisheries, as Oistins hosts the largest fishing community in the island; these fisheries are important both for local food security and for the tourism industry, but have also experienced overfishing (GOB, 2004). Oistins has been identified as being at risk from an increase in climate-related events, as it supports small (i.e. vendors), medium (i.e. small hotels) and large-scale (i.e. large hotels) tourism related activities, lies low in a basin with its physical resources and infrastructure, including tourism facilities, fish-market and fishing boats, located very close to the coast (Simpson et al., 2012).

This research devises a conceptual framework to assess the nested vulnerability of a tourism destination community in a Small Island Developing State utilizing the four 'Climate Change Impact Pathways on International Tourism' developed by Scott, Hall and Gössling (2012a). The pathways include: 1) direct climate impacts; 2) indirect, climate-induced environmental changes; 3) indirect climate-induced socio-economic changes; and 4) impacts due to mitigation and adaptation responses in other sectors.

Fig. 2 portrays the nested, external factors and scales (international,



Fig. 1. Map of Barbados, highlighting Oistins.

Source: [Burmese days \(2012\)](#) – reproduced in original form, except for circling of Oistins

island and community) in which climatic and non-climatic stressors can influence tourism destination vulnerability. The pathways arise externally to the tourism sector, with the exception of ‘pathway #4’ being developed distinctly by international parties. Furthermore, ‘contextual vulnerability’ can be assessed at the community and island levels, while

‘outcome vulnerability’ is predominantly considered at the island or sectoral level. The framework also demonstrates that adaptation needs and options can be identified and implemented by the community, island and international scales.

The conceptual framework was used to inform the assessment of ‘contextual’ tourism sector vulnerability of Oistins, within a national and international context. A place-based vulnerability assessment using the nested approach was conducted in the winter of 2011 (the principle tourism season). The study investigated current and future vulnerability to multiple stressors (2001 to 2011), according to the climate change impact and tourism pathways. The study examined vulnerabilities at the local, regional and national level, based on perceptions of stakeholders, institutional informants, and focus group participations, as well as within the context of documented trends in the grey and academic literature. This approach allowed for identified community level vulnerabilities to be up-scaled to broader determinants of vulnerability and larger-scale processes, a key factor in completing a nested vulnerability analysis. This conceptual framework for data collection is unique to the nested approach, because it portrays the external factors and distinguishes vulnerability at several scales in which climatic and non-climatic stressors can influence tourism destination vulnerability. A CBVA approach would have focused mainly on issues at the community-scale, with a limited connection to vulnerability determinants across and beyond systems.

Forty-eight individuals participated in thematic semi-structured open-ended interviews, including: i) community stakeholders whose livelihoods were most connected to the tourism-related activities of the community (i.e. vendors, lifeguards, hotel-workers, accommodations) and ii) institutional stakeholders, including decision-makers and/or representatives pertaining to tourism development, local government, fisheries and emergency management. A local partner helped to identify relevant individuals that met the livelihood connection criteria, and snowball sampling was used to expand the participants. Institutional stakeholders were selected via ‘criterion’ sampling, based on their knowledge and connection to Barbados’ tourism industry and the community of Oistins ([Bradshaw & Stratford, 2010](#)). Five focus groups were also held with 23 individuals, representing institutional and community level organizations. Community and institutional

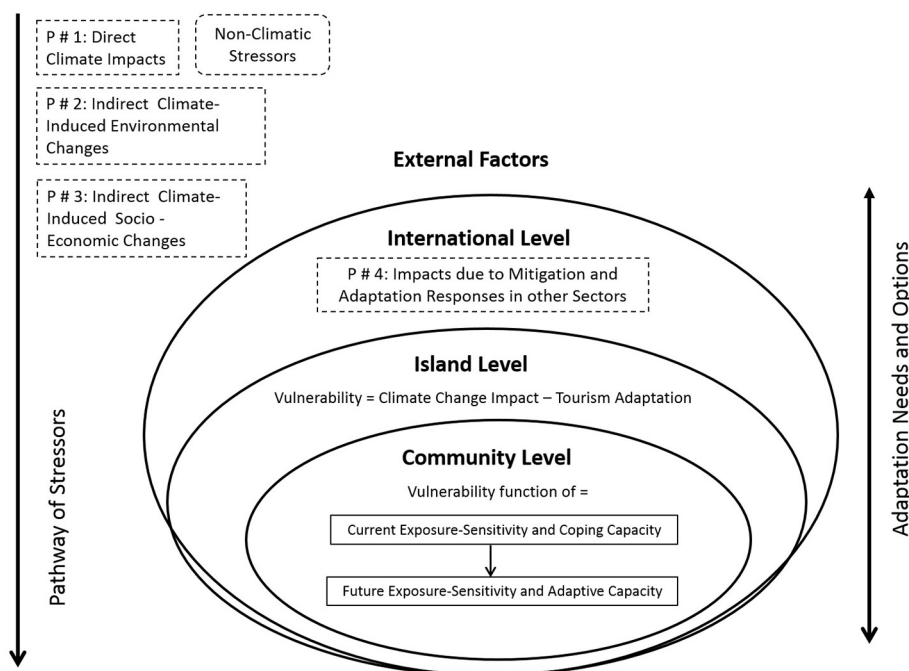


Fig. 2. Conceptual framework for a vulnerability assessment of the tourism sector in SIDS.

Source: Manuscript author.

**Table 1**  
Individual interview research participants.

Stakeholder tourism activity	Number of interviewees	Gender	Age range	Educational attainment
Community level stakeholders				
Bay garden food and craft vendors	13	Male: 3 Female: 10	21–58 (mean age: 50)	Elementary: 3 Secondary: 4 College/ University: 5
Fishermen	9	Male: 9 Female: 0	35–65 (mean age: 49)	Elementary: 4 Secondary: 3 College/ University: 2
Beach-related activities (vendors, lifeguard, water sports operators)	10	Male: 6 Female: 4	25–63 (mean age: 46)	Elementary: 1 Secondary: 7 College/ University: 2
Accommodation and restaurants (managers and staff)	10	Male: 6 Female: 4	35–76 (mean age: 54)	Elementary: 0 Secondary: 5
Institutional stakeholders				
University, local/national government	6	Male: 3 Female: 3	35–55 (mean age: 47)	Elementary: 0 Secondary: 0 College/ University: 6

interviews and focus group questions were designed to explore linkages between community-scale processes and broader national and international contexts. The interviews assessed the past and current exposure-sensitivity and coping capacity of stakeholders to changing climatic and/or social conditions in the past ten years. They then assessed the future exposure-sensitivity of stakeholders to changing conditions and the resources as well as support that would be needed to adapt. All interviewees and focus group participants were approached at their place of work, either in person or by phone, until the saturation point was achieved and no new information was obtained during interviews. The interviews were conducted in person and averaged an hour in length. Table 1 presents the research participants, many of whom lived in the Oistins area, and included 20 females and 28 males.

All responses were analyzed via thematic coding (Cope, 2010), where information collected was thematically coded according to common phrases in the interviews. The nested approach allowed for analysis from a multi-scalar perspective, focusing on local, national, and international stressors and drivers of vulnerability in the context of a changing climate. Interviewee responses were then compared to grey and academic literature pertaining to Barbados, the Caribbean, small islands and tourism destination communities, to determine if identified exposure, sensitivities, and adaptive capacities corresponded to previously known information.

#### 4. Vulnerability assessment of Oistins

The following section presents the results of the vulnerability assessment based on interviews with community and national level stakeholders, as well as the results from the literature review. Both stakeholder groups provided insight on current and future stressors impacting upon Oistins, while community-level stakeholders also detailed particular strategies to cope and adapt.

##### 4.1. Current stressors

Stakeholders discussed perceived changes in their natural, social or economic environments in the past 10 years and whether any of these changes had made it difficult to carry out their tourism-related livelihoods. Table 2 summarizes changes due to climatic and non-climatic stressors, and the pathways portrayed in Fig. 2, and significant impacts

**Table 2**  
Oistins perceived stressors (2001–2011) and any significant tourism-related impacts.  
Source: Author.

Pathway	Climatic stressors	Impacts	Non-climatic stressors	Impacts
Pathway 1: Direct impacts of multiple stressors	<ul style="list-style-type: none"> <li>Increased summer heat.</li> <li>Increased rains and winds, in particular in the winter of 2011.</li> <li>Tropical Storm Tomas in 2010.</li> </ul>	<ul style="list-style-type: none"> <li>Greater reliance on air conditioning and higher operating costs for three small and mid-size accommodations/restaurants.</li> <li>Four crews lost 1–2 weeks of fishing/month.</li> <li>Infrastructure damage (destroyed a vendor's pottery shop, sank three day-fishing boats, loss of revenue for three restaurants for a few days to a month).</li> <li>No personal impacts.</li> <li>Less ability to in-shore reef fish.</li> </ul>	<ul style="list-style-type: none"> <li>Economic recession of 2008.</li> <li>Inflation.</li> </ul>	<ul style="list-style-type: none"> <li>Decreased number and spending of tourists, particularly during 2008–2010.</li> <li>Business interruptions, higher operating costs and decreased revenue.</li> <li>Both impacted all stakeholders, with livelihoods of some more affected than others.</li> </ul>
Pathway 2: Indirect climate induced environmental changes	<ul style="list-style-type: none"> <li>Lower rainfall, in particular drought in 2009/2010.</li> <li>Biodiversity loss to reef fisheries.</li> <li>None noted.</li> </ul>			
Pathway 3: Climatic induced socio-economic changes or non-climate induced socio-economic changes				
Pathway 4: Impacts caused by mitigation and adaptation responses in other sectors	<ul style="list-style-type: none"> <li>British Air Passenger Duty Tax.</li> <li>Increasing insurance premiums.</li> </ul>	<ul style="list-style-type: none"> <li>Less tourists visiting the island and less spending when they visit.</li> <li>No significant impacts yet.</li> </ul>	<ul style="list-style-type: none"> <li>The prolonged effects of the economic recession, reducing global GDP and impacting tourist wealth.</li> </ul>	<ul style="list-style-type: none"> <li>Impacted the livelihoods of all stakeholders.</li> <li>Business interruptions, higher operating costs, decreased revenue and infrastructure damage.</li> </ul>



on Oistins and its tourism sector.

#### 4.1.1. Climatic and non-climatic exposure-sensitivities

Forty-four percent of stakeholders, predominantly vendors and accommodations, noted the direct climatic impact (*pathway #1*) of increasing air temperatures leading to higher operating costs. For example, one interviewee noted:

*"I have noticed that it is getting hotter in the summer... The summer electricity bill went up due to increased use of air-conditioning by guests. Now the bill is increasing due to higher utility costs".*

Tourism Hotel Org 4, SH 38.

Heavier and increased rainfalls in the fall were perceived to have increased by the majority of stakeholders, and over half also observed that winds have become stronger, resulting in stronger and higher waves:

*"Our seasons have changed and the rainy season is going later into the fall. The summers can be drier and the rain is coming later".*

Beach Related Activities, Water Sports Operator 3, SH 31.

The major impact identified from increased and heavier rains and stronger winds waves was to the number of fishing days, thus reducing local fish supply and increasing import prices.

Interviewee observations mostly correspond well with the grey and academic literature. Recent and long-term increases in daily minimum surface air temperature have been noted, and wind observations correlate well with climatic trends (BMS, 2014a; Stephenson et al., 2014). Conversely, historic precipitation trends demonstrate variable precipitation, ranging from heavy rains to drought, indicating that stakeholder observations may not be entirely accurate (BMS, 2014b; Stephenson et al., 2014).

All stakeholders noted indirect climate induced environmental changes (*pathway #2*) due to varying water availability, though the tourism industry was not significantly impacted by this. This finding is supported in the literature as the island has experienced severe drought in the last decade (2002–2012), with six of the last ten years (2006–2012) being abnormally dry (BMS, 2014b; Simpson et al., 2012). In addition, five fishers noted declining reef fisheries on the south-coast, which has been documented for several years (GOB, 2004), though remains challenging to attribute solely to climate variability.

None of the stakeholders noted any climate induced socio-economics impacts (*pathway #3*), although they did highlight impacts caused by mitigation and adaptation strategies in other sectors (*pathway #4*). Stakeholders were asked about any perceived impacts of the British Air Passenger Duty (APD) Tax mitigation policy (*pathway #4*), created on four geographical bands based on the travel distance from London, England to the capital city of the country concerned, with the Caribbean falling into the third (Band C) (ABTA, 2014). Eight stakeholders, predominantly institutional, were familiar with the Tax and regional opposition to it and predicted it would result in fewer tourists visiting the island. However, recent studies found the Tax to not have had any effects on British outbound tourism to the Caribbean between 2007 and 2010 (Scott, Gössling, Hall, & Besco, 2014). Furthermore, 40% of all stakeholders had infrastructure or content insurance, considered an adaptation policy, with others noting its high costs. Stakeholders noted the financial impacts of higher insurance premiums, which are predicted to increase with climate change (ABI, 2009).

In summary, almost half of community-level stakeholders perceived recent climate-variability to be impacting their tourism-related livelihoods, via higher operating costs, business interruptions and infrastructure damage. Nevertheless, all noted that tourists' behaviour had not changed with the variable weather. The perceived higher temperatures, increased rain and strong waves were not severe enough to stop tourists in Barbados from enjoying the beach or visiting the fish-market. These findings are similar to other research which found higher temperature tolerances of Caribbean tourists visiting from temperate

regions, primarily for beach-related activities (Rutty & Scott, 2013).

Non-climatic stressors facing the destination-community of Oistins and island as a whole included the global economic crisis of 2008 and increasing cost of living due to inflation and a higher value added tax (VAT). The majority of vendors, beach-related activities and accommodations and restaurants perceived the crisis to have decreased the number of tourists visiting the island, with the 2008–2009 tourist season hardest hit. This observation is supported by the literature; the economic crisis declined total tourist arrivals to Barbados by 9.3%, between 2007 and 2010 (GOB, 2012). The island's tourism sector, after a slightly positive performance in 2011, experienced arrivals reducing by 5.6% between 2012 and 2013, with a further 1% drop year-on-year in the first quarter of 2014 (UNECLAC, 2014). Furthermore, over a third of stakeholders noted that tourists were spending less or not staying as long, confirmed as Barbados' international tourism receipts have continued to decline since the start of the economic crisis (World Bank, 2012). This is highlighted by one interviewee who noted:

*"The economic situation is affecting the number and spending of tourists... Most people are asking for bargains. I have seen this happening for the past two years".*

Bay Garden Craft Vendor 2, SH10.

Inflation was perceived to affect all stakeholders, with the majority noting increased prices for fuel, food, tourism-supplies and fishing equipment, coupled with an increase in the island's VAT. The literature notes that inflation peaked at 9.6% in 2011 (UNECLAC, 2013), and Barbados fuel import bill rose from 7% of total imports in 1998 to over 25% in 2011 (Moore & Jones, 2011), with the island also importing up to US \$300 million of food annually to support local and tourist consumption (FEAMWU, 2012). This supports stakeholder observations related to the impact of inflation on tourism-industry operating costs as well as cost of living expenses.

#### 4.1.2. Coping strategies, resources available and constraints

Community-level stakeholders, as identified in Table 1, presented several strategies to cope with the impacts of variable climatic and non-climatic conditions. Climate-related strategies included vendors, fishers and accommodations becoming energy and water efficient, with the latter putting up notices for guests, similar to what was recommended by Charara, Cashman, Bonnell, and Gehr (2011). Furthermore, the fisheries sector as a whole has coped by improving fishing methods, integrating operations, shifting to other economic activities and abandoning fishing (James, 2008). Some of the strategies used in the fishing sector were outlined by one interviewee who noted:

*"I have a fish finder, sonar and a GPS. When a fish bank is found, the fishers contact one another to share the information."*

Fisherman 8, SH 21.

To cope with climatic and non-climatic stressors, many stakeholders reduced their expenses or ceased their livelihood, in particular food and craft vendors, fishers and beach-related activities operators. Almost half engaged in another activity to provide supplementary income, with only some being tourism-related. In addition, a quarter of stakeholders noted they provided their services at another time or location. To address primarily non-climatic changes, a quarter of stakeholders, apart from fishers, engaged in more aggressive and creative marketing. Moreover, more than half of stakeholders noted they had absorbed any increased costs and made do with less income, with 20% passing on costs by slightly increasing their prices.

To cope with the impacts of multiple stressors, half of the community-level stakeholders relied on family, friends and tourists to run their businesses, carry out repairs due to a weather-related event or provide financial assistance. Some vendors used social media to build relationships with tourists and obtain goods, while some operators had arrangements with external agencies to solicit business. Some hotel staff also bartered and exchanged goods with fellow staff. In addition,

almost half the stakeholders had financial capital in the form of infrastructure or content insurance. Furthermore, a few stakeholders had access to other human capital (i.e. training) and some could draw upon natural capital, including food vendors having relatives working as fishermen. Almost half of the stakeholders had political capital, through affiliation with a local organization, which could potentially assist with emergency planning. This included half of the food vendors being members of the Bay Garden Vendors Association, although this organization had no Emergency Management Plan (EMP) at the time of data collection. For stakeholders involved in the fishing industry, the Oistins Fishers User Committee had a 'Draft Rapid Response Plan' for its boats and the Fisheries Department had a national disaster EMP. Larger hotels and some restaurants were part of the Barbados Hotel and Tourism Association, which had developed an EMP for accommodations and transportation services. No EMPs existed for independent businesses and no EMP existed for the tourism-destination-community of Oistins as a whole.

Constraints to coping with changing conditions almost exclusively pertained to non-climatic stressors. A few stakeholders noted excessive competition amongst tourism services in Barbados, making it hard to increase prices. Furthermore, some of the large hotels work with foreign tour operators, who do not increase local costs. In addition, some stakeholders noted conflicts amongst each other, for instance tourist snorkeling off the Oistins jetty interfering with fishing boat activity. Certain limits to cope could pose greater constraints for future climate change adaptation, when climatic impacts become more severe (Kaján, 2013). For instance, if extreme climate-related events were to damage Oistins' tourism infrastructure, community-level stakeholders would need to further discount their operations to stay competitive amongst tourists, thereby exhausting current adaptive strategies.

## 4.2. Future stressors

### 4.2.1. Future climatic and non-climatic exposure-sensitivities

Stakeholders had ranging opinions on their future exposure-sensitivity to changing climate, with a third concerned about projected changes; the variation in responses is consistent with other research findings, where challenges have been highlighted in considering the diversity of local environmental knowledge (Ford & Pearce, 2012). Concerned stakeholders were asked whether future change could impact Oistins and further increase the vulnerability of their tourism-related livelihoods. All thought that such changes could have an impact upon natural features important to tourists and damage physical infrastructure. In addition, 40% believed that future impacts could lead to fewer tourists visiting the island. In particular, they thought the increased heat would lead to increased energy bills and increased rain would decrease business for outdoor vendors and affect beach-related activities. This is somewhat supported by the literature where predicted climatic changes for Barbados by 2075–2099, include mean annual surface temperature increases up to 3.0 °C and annual average rainfall decreases of 10–20% (Hall et al., 2013).

Stakeholders noted that increased winds would lead to less swimming and water-sports activities (i.e. catamaran use), while also increasing other activities (i.e. surfing). Moreover, the literature suggests that more intense hurricanes would impact upon tourism-businesses and lead to less tourists visiting the island, as also noted by Forster et al. (2012). By 2100, tropical storms are projected to increase in global average intensity by 2–11% (Knutson et al., 2010), meaning that Caribbean storms could become stronger and bring more economic damage. Institutional stakeholders were also concerned about the immediate impact of any transportation responses, as Barbados is far from its source markets. The impacts of mitigation responses, to address transportation emissions and adaptation responses to address increasing insurance costs, are predicted for the tourism sector (Scott, Hall, & Gössling, 2012). Finally, stakeholders were asked whether they perceived non-climatic stressors would continue in the future and if so,

whether it would result in further impacts to their livelihoods. The majority of stakeholders stated that if the social and economic conditions noted earlier remained un-changed or worsened, they would continue to adversely impact everyone.

### 4.2.2. Future adaptive strategies, resources available and constraints

Twenty percent of community-level stakeholders thought that there is not much one can do to prepare for future changes. A quarter of respondents were not confident about climate predictions, a consistent finding with other tourism adaptation studies (Turton et al., 2010). Furthermore, four individuals thought that a 'God' would take care of them, a common finding in the comprehension of climate change vulnerability (Shakeela & Becken, 2015). This is highlighted by one interviewee who noted:

*"I am not worried as I believe in the Bible and these things will happen before Jesus comes... Scientists don't control the weather; God does... He (God) decides if Barbados is going to be 'licked-up'".*

Bay Garden Food Vendor 3, SH 3.

Community-level stakeholders noted numerous strategies to adapt to future conditions, as presented in Table 3. These included a greater consumption of local and regional fisheries and food, as also advocated by the Ministry of Tourism (GOB, 2012), and the conservation of water and energy:

*"Barbados should foster greater food security and import food from neighbouring islands like St. Vincent and Guyana".*

Tourism Key Informant, SH 46.

Moreover, all stakeholders indicated they would need social, financial and physical support to implement adaptation measures, including further cooperation amongst stakeholders, increased economic loans and the retrofitting of boats. Certain strategies would require the support of local and national institutions. For example, at the destination-community-scale, it was suggested that the BGVA could recruit members to develop an EMP and such a process could be mandated by the national government. In addition, some respondents indicated that the capacity of fisher-folk organizations could be strengthened to facilitate membership and create a cooperative to store fish and set prices. The government could also consider aquaculture to increase local fish supply, in addition to establishing higher fish-prices, as noted by one respondent:

*"If the fisheries industry remained local, that would be better. For this, the design of vessels should change, including proper refrigeration*

**Table 3**

Adaptation strategies identified by interviews.

Source: Author.

Local
<ul style="list-style-type: none"> <li>• Greater reliance on local food and fisheries, including imports from neighbouring islands.</li> <li>• Promote energy and water conservation by accommodations and restaurants.</li> <li>• Further access to resources (i.e. social: beach vendors co-operatively setting prices, financial: improved availability and access of loans and reduced insurance and permitting fees for small businesses, physical: tents for food vendors, sheltered craft vendors area, improved drainage, facilities to haul fishing-boats in variable weather and boat retrofitting to increase fishing capacity for local and tourist consumption).</li> <li>• Strengthen capacity of local tourism and community organizations to facilitate any adaptation initiatives (i.e. development of EMPs, record keeping of businesses and fish catches).</li> </ul>
National
<ul style="list-style-type: none"> <li>• Diversify, expand and create a value-added local and cultural tourism product (i.e. marketing of Oistins' history and creation of fish shops).</li> <li>• Diversify the tourism market from a 'north-south' relationship to neighbouring countries in the 'south' (i.e. Brazil).</li> <li>• Diversify the economy beyond tourism.</li> <li>• Cease the British Air Passenger Duty Tax.</li> </ul>

*facilities. As fishers are spending a few months at sea, they could process at sea”.*

Fisheries Key Informant, SH 44.

Institutional stakeholders highlighted that any adaptation initiatives should be mainstreamed into the community's tourism operations, similar to recommendations proposed in the literature by (Turton et al., 2010). Particular examples provided by respondents included having the SCC District Emergency Organization (DEO) and the Constituency Council collaboratively ‘map the community’ and its tourism facilities, and develop an adaptation plan for the entire tourism destination-community. Furthermore, the local DEO's ‘Community Profile’ should identify guest-houses and hotels in Oistins, especially those not formally registered.

Community-level stakeholders noted that the national government should diversify the Oistins' tourism product by marketing its history and fisheries activities, as also noted by the Ministry of Tourism (GOB, 2012). Many stakeholders proposed a number of strategies, including: that the government establish shops and a processing plant at the Fish-Market to sell value added fish to vendors and hotels; address the increasing operating costs for businesses; and increase the fuel subsidy for fishers. Furthermore, it was recommended that the Ministry of Tourism should diversify Barbados' tourism market from a current emphasis on ‘north-south’, to long-haul and emerging source-markets (i.e. England, China, India and Russia), as noted in the Ministry's white paper on tourism (GOB, 2012), and emphasize neighbouring countries in the ‘south’ (i.e. Brazil). Stakeholders also noted the need to diversify the island's economy beyond tourism, yet provided no specific examples. They also advocated ceasing the APD Tax, which the British government revised by abolishing the furthest two geographical bands after the time of data collection (ABTA, 2014).

Although respondents highlighted many adaptation strategies, they also noted a number of constraints that limited their ability for implementation. Constraints community-level stakeholders faced in adapting to future stressors were similar to constraints faced in coping with current stressors and pertained mostly to locally-based adaptations. General apathy was noted in Oistins, as many people considered that God will protect them. Furthermore, some of the tourism and community organizations lacked institutional capacity. In particular, vendors and fishers would benefit from the collaborative development of adaptation initiatives via their respective associations, also supported by McConney, Nurse, and James (2009).

*“I created the Oistins Craft Vendors Association in 2009... There is not a lot of togetherness (amongst vendors) and it is hard to coordinate meetings. The majority of people joined, though the association is not very active and doesn't have any unity. It is hard to get support from the membership”.*

Craft vendor 2, SH 10.

Financial constraints were also faced in purchasing improved infrastructure or providing higher staff wages to address rising living costs. Monitoring energy use would require proper equipment and high government permitting fees could hamper new tourism businesses. To foster the sale and production of local food items, interviewees recommended the national government could put duties on imported fish that enters the market, which the Ministry of Tourism supports (GOB, 2012), for which there would need to be an examination of whether the local fish supply could be increased sustainably. Local crafts could also be promoted for sale to tourists. In addition, many of the fishers stated they would need to be paid more for their catch to account for rising operating costs. Finally, the notion that uncertainty remains in the anthropogenic role in climate change was also considered an adaptation barrier, and has been highlighted in other studies as well (Scott, Hall, & Gössling, 2012; Turton et al., 2010).

## 5. Discussion

This research sought to determine: whether the nested approach is appropriate for delineating vulnerability and developing adaptation strategies in tourism dependent communities; understand the climatic and non-climatic stressors influencing vulnerability at the tourism destination-community scale; and, consider the climate change vulnerabilities of tourism-dependent workers. Each of these goals is discussed below.

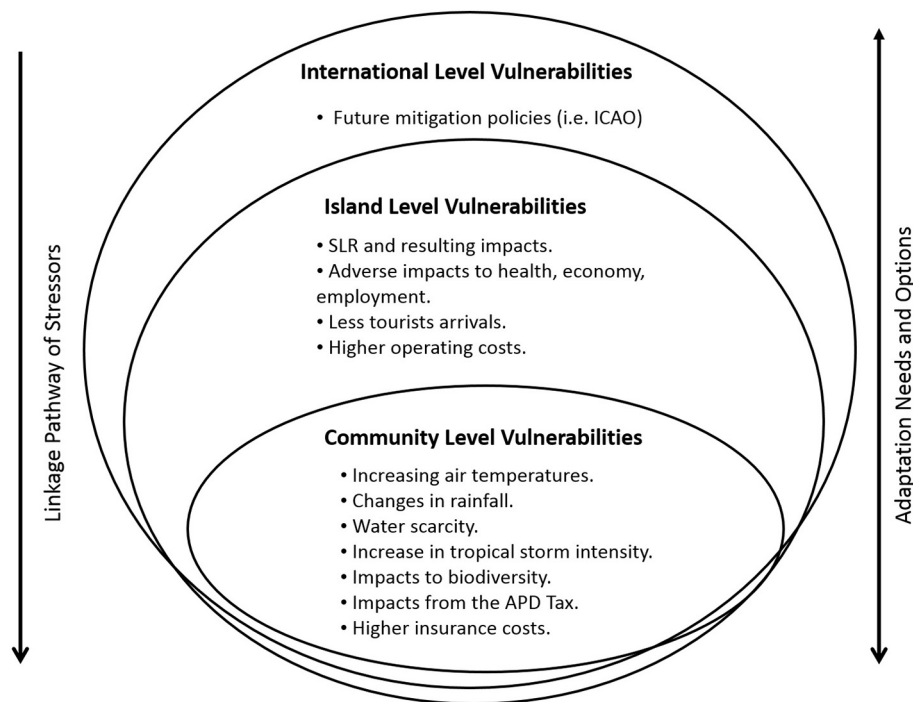
### 5.1. Nested approach for understanding vulnerability

This study found that the place-based vulnerability assessment using a nested approach allowed for the examination of vulnerabilities between community, island and international scales. Thus, the approach allowed for the examination of tourism-related issues within a larger more fluid boundary. While some stakeholders focused mainly on the local level, other stakeholders provided relevant information at higher scales, indicating that data collection was not constrained to a fixed border. Furthermore, the information brought forth for the tourism sector (by the community level stakeholders) was not novel and was limited in advancing the understanding of climate change vulnerability of the destination-community, although institutional level stakeholders provided further insights. Similar findings were noted by Kaján (2013) for two small resource dependent tourism destination communities in the Finnish arctic. A focus on the Community-Based Vulnerability Assessment methodology would likely have limited the results of the vulnerability assessment to the community level, suggesting the nested approach allowed for a deeper understanding of multi-scalar vulnerability issues. This wider understanding of tourism-related vulnerability at the tourism community scale enabled the examination of the results within a national level understanding of sectoral vulnerability. This is important, as the research results highlighted that information gaps remained in the community level understanding of tourism and climate change vulnerability in Barbados, including a comprehensive consideration of multiple stressors. Thus, this research found that limitations of the CBVA method in comparing findings across and beyond communities were addressed by examining the ‘nested’ vulnerability of Oistins at several scales.

The nested approach highlighted that most long-term and extreme vulnerabilities and adaptation measures identified by tourism-stakeholders occurred above the destination-community scale and are therefore largely outside the control of Oistins. Fig. 3 provides an overview of the nested understanding of tourism-sector vulnerabilities at different scales. This finding confirms the importance of encouraging adaptation in national tourism planning and that perceptions of climate change impacts still have an important link to communities (Tsai, Wu, Wall, & Linliu, 2016). However, the finding brings into question whether local tourism-stakeholder driven adaptation can remain viable and whether sectoral and local-level adaptations are always consistent. It also questions whether for SIDS it is more useful to examine tourism destination issues at a national scale and broader adaptation issues at a community scale, similarly found by Kaján (2013) in her examination of small tourism destination communities in the Finnish arctic. In the Caribbean coastal context, local government capacity to address climate change could be enhanced with support from higher-level government (Hogarth & Wojcik, 2016; Pittman et al., 2015).

### 5.2. Understanding multiple stressors

A range of stressors was identified both by participants involved in the research as well as through a review of the literature. Table 4 presents an overview of the stressors as identified in the literature (CCCCC, 2009; GOB, 2001; GOB, 2012; UNECLAC, 2011). This is compared to stakeholder identified stressors (Table 2) based on the timing of predicted impacts, with the ‘Stakeholder Identification’



**Fig. 3.** Nested understanding of tourism-sector vulnerabilities at different scales.  
Source: Manuscript author.

**Table 4**  
Vulnerabilities of Barbados and Oistins' tourism sector to multiple stressors.  
Source: Author.

Stressors	CBVA results	Timing of impact
<b>Climatic</b>		
Pathway 1 – direct impacts of climate		
Changes in storm intensity and rainfall patterns.	C	2050
Higher temperatures leading to greater energy and water use and higher operating costs.	C	2100
Warmer winters in key source-markets and in Barbados leading to less tourist arrivals.	N	2100
Higher capital costs to protect beach properties and to market destination.	N	2030
Pathway 2 – indirect climate-induced environmental changes		
Increased SLR, impacting upon beaches and relocation of infrastructure, leading to higher capital costs.	F	2100
Coral bleaching affecting diving.	N	2030
Water scarcity.	C	2050
Reduced fisheries biodiversity.	C	2050
Impacts upon local food production.	C	2030
Pathway 3 – indirect climate-induced socio-economic changes		
Indirect climate induced socioeconomic changes.	N	2050
Pathway 4 – impacts caused by mitigation and adaptation responses in other sectors		
Mitigation responses, in particular British Air Passenger Duty Tax.	C	2030
Higher premium and operating insurance costs.	C	2030
<b>Non-climatic</b>		
Heavy consumption and cost of imported energy and food.	C	
Economic dependence on tourism.	C	
Volatile oil prices, leading to increased airfare and operating costs (inflation).	C	
Prolonged global financial crisis.	C	
Rising food prices (inflation).	C	

Note: C = Current, F = Future, N = Not identified at all.

column indicating whether respondents felt the stressor was current (C), in the future (F) or not identified at all (N). For a critical assessment of the predicted vulnerabilities of Barbados' entire tourism sector via multiple stressors and the state of climate change preparedness, see Moghal (2015). The identified stressors might be limited in number as impacts focused on the tourism sector and only some were noted, with five key stressors missing. Similar findings are observed when comparing to other studies in similar contexts. Kaján (2014) distinguished 15 climatic stressors in two small arctic tourism communities and Bunce, Rosendo, and Brown (2010), who examined a larger sample size in two African coastal states, noted 12 climatic and non-climatic stressors affecting tourism-related livelihoods.

Stakeholders observed minor, near term and local-level climatic stressors to be impacting them, although these were not currently affecting tourism-related activities. These stressors included changes in tropical storm intensity and rainfall patterns, increases in air temperatures, lower water availability, reduced fisheries biodiversity and impacts on food production, which are all predicted to increase in magnitude by mid to late century (apart from impacts to food production) (Gössling et al., 2012; Hall et al., 2013; Knutson et al., 2010; McConney et al., 2009). A variety of impacts were faced by stakeholders from these direct and indirect changes to their tourism-related livelihoods, including higher energy costs, business interruptions, infrastructure damage (*pathway #1*) and on natural assets important for the destination (i.e. fish, food and water) (*pathway #2*). Stakeholders also perceived the more immediate impacts from the APD Tax mitigation policy, even though they have not been proven in the literature (Scott et al., 2014), and increasing insurance costs (*pathway #4*) (ABI, 2009). In addition, stakeholders noted the impacts of the majority of the non-climatic stressors also detailed in Table 4.

Local stakeholders did not recognize other significant vulnerabilities that future climate change could bring to the tourism sector, which is important as comprehensively understanding the dynamic nature of vulnerability allows for greater uncertainties to be addressed (Student et al., 2016). These vulnerabilities included changing weather in key source-markets leading to fewer tourist arrivals (Hamilton & Tol, 2007) and higher capital costs to protect coastal properties (Scott, Simpson, &



Sim, 2012) (*pathway #1*), including a lack of private sector investment in risk reduction, a critical vulnerability driver (Becken et al., 2014). Other unforeseen vulnerabilities included sea-level rise, leading to the deterioration of coastal features and infrastructure (Scott, Simpson, & Sim, 2012) (*pathway #2*). The impacts of coral bleaching, even though they are not key tourist attractions, and any impacts upon local food production (CCCCC, 2009; Scott, Simpson, & Sim, 2012) were also not identified.

No impacts were identified for *pathway #3*, in regards to climate-induced socioeconomic changes leading to adverse impacts on the economy or employment (Scott, Hall, & Gössling, 2012). In addition, local and national level stakeholders did not recognize vulnerabilities due to future international mitigation policies, such as those by the International Civil Aviation Organization (ATAG, 2013), and how they could affect the Ministry of Tourism's plans to market Barbados' tourism sector to long-haul tourist markets (*pathway #4*). Other predicted climate change impacts to Barbados, not noted by stakeholders, include sea-level rising up to 2.15 m by 2100 (Rahmstorf, 2010), with smaller islands facing higher per capita economic costs (Simpson et al., 2010). Moreover, the economic impacts of SLR could be super-ceded by losses to tourism through rebuilding costs and to national GDP through loss of beach amenities (Simpson et al., 2010). Mid-century, Barbados could also face chronic water shortages, limiting the growth of the heavy using tourism industry (Gössling et al., 2012) and face significant impacts to fisheries biodiversity (McConney et al., 2009).

### 5.3. Vulnerability of tourism-dependent workers

The study's empirical results suggest that Oistins interviewees were familiar with climate change and its possible impacts, though non-climatic stressors were considered more significant and causing greater adverse impacts to the tourism sector and their resultant livelihoods, which is likely the case as well for other destination communities in the Caribbean and worldwide. Stakeholders were facing biophysical and social vulnerability due to minor and local-level impacts of weather changes, yet, this variability did not appear to significantly affect tourism activities. Moreover, all stakeholders were facing social vulnerability due to non-climatic stressors, in particular the continued effects of the 2008 economic crisis and inflation. Operators and workers within small to mid-scale businesses faced the highest exposure-sensitivities and lowest adaptive capacities to climatic and non-climatic stressors. Stakeholders were drawing upon a variety of strategies and resources to cope with both types, though most limits pertained to non-climatic stressors. Small to mid-scale tourism-operators and workers faced the highest exposure-sensitivities and lowest adaptive capacities to both stressors (i.e. the Bay Garden Food and Craft Vendors, fishers, operators of beach-related activities and managers and staff of small restaurants and hotels).

In regards to future exposure sensitivities, concerned stakeholders were focused on near-term or minor weather changes, not the more significant or severe impacts of climate change, including sea-level rise, ecosystem changes or the mobility of international tourists. This was evident due to some of the adaptive strategies being easily solvable (e.g. providing more tents for vendors to address increasing rains). Furthermore, the adaptive strategies suggested differed by scale, with some that could be undertaken by destination-community stakeholders (e.g. energy conservation) and others that would require the support of national or international stakeholders (e.g. diversifying the economy beyond tourism). The impacts of climatic stressors on the tourism sector might become more prominent in the future, when impacts are predicted to increase (Kaján, 2013).

The majority of recommended adaptation strategies and resources pertained to near-term or minor impacts of climatic stressors, when tourists are still envisioned to visit the island, or to non-climatic stressors. Stakeholders did not consider long-term or severe climatic change impacts, for instance infrastructure damage due to SLR or higher

regional temperatures, the latter which could reduce tourism demand in source-markets (Hamilton & Tol, 2007; Scott, Simpson, & Sim, 2012).

## 6. Conclusion and recommendations

This study has examined the multiple stressors influencing vulnerability in a small island tourism-destination-community, thereby informing and contributing to literature pertaining to more effective sectoral and community-level adaptation. It advances the theoretical and conceptual understanding of tourism and climate change vulnerability at the destination-community scale using a 'nested' case study, in particular at what scale in which to examine sector adaptation. As tourism-related vulnerabilities were not well understood at the destination-community scale, local stakeholder driven anticipatory adaptation remains questionable, thereby demonstrating that sectoral and community-level adaptations are not always consistent and/or appropriate (Kaján, 2013). In the case of SIDS, this finding suggests that it is more useful to consider tourism-related adaptations at the national scale and obtain more specific adaptation information at the community scale. Future research should continue to examine in which scales to foster adaptation for tourism and tourism destination communities, and the interaction of climate change vulnerabilities with each other and non-climatic stressors (Scott, Hall, & Gössling, 2012).

The study's empirical results imply that local stakeholders will continue to require assistance for anticipatory adaptation to address the long-term impacts of change, as climate change and tourism sector vulnerabilities are not well understood at the destination-community level in Oistins. Furthermore, the manner in which stakeholders are coping with present climatic and non-climatic stressors and plan to adapt to future changes provides insight in how they could adapt to further minor changes in weather. For these reasons, further research is needed on how local stakeholders could adapt to the future impacts of significant or more extreme climate-change (Scott, Hall, & Gössling, 2012). This could also mean diversifying the community's tourism market and activities (GOB, 2012), including by further marketing Oistins' history and fisheries activities. Practical contributions of the research suggest continued efforts be made to enhance the adaptive capacity of stakeholders to current and future stressors, particularly those facing high exposure-sensitivity, including increasing their understanding of climate change and its possible impacts to the tourism sector, and to their destination-community, and by enhancing disaster prevention initiatives (Tsai et al., 2016).

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